

IT IS CLAIMED:

1. A method of processing a human interface signal, comprising modifying the interface signal in a manner minimizing the perceptibility of the modification when the interface signal is reproduced but which modifies the signal sufficiently so that a reduced quality is perceptible in a signal reproduced from a compressed version of the modified signal upon its decompression.

2. The method of claim 1, wherein the interface signal is a audio signal and the reproduced signal is a sound signal.

3. The method of claim 2, wherein modifying the audio signal includes increasing levels of certain frequency components of the audio signal.

4. The method of claim 2, wherein modifying the audio signal includes ascertaining spectral distributions of temporally successive blocks of data of the audio signal, determining masking functions for individual ones of the spectral distributions of data, an individual masking function defining upper levels of frequency components of its associated block of data to which perception of the signal does not change, and increasing the levels of at least some of the frequency components of the spectral distributions below their respective masking functions.

5. The method of claim 2, wherein the audio signal includes at least first and second channel signals , and wherein modifying the signal includes altering a relationship between said at least first and second channel signals.

6. The method of claim 5, wherein altering relationships includes altering amplitude, timing or phase relationships between said at least first and second channel signals.

7. The method of claim 5, wherein modifying the audio signal additionally includes utilizing the relationship between said at least first and second channel signals to unmask components of the audio signal that are masked.

8. The method of claim 2, wherein modifying the audio signal further includes doing so in a manner which causes a sound data compression and decompression

algorithm, when compressing the modified audio signal, to at least part of the time invoke at least one compression mode that is different from that which is invoked by the audio signal alone in order that the compressed version thereof results in a version of the audio signal that is perceptible upon its decompression to be undesirably changed.

5 9. The method of claim 8, wherein modifying the audio signal further includes doing so in a manner which causes the compression and decompression algorithm to compress the modified audio signal by invoking said at least one algorithm compression mode that is alternately the same and different from that which is invoked by the original audio signal alone.

10 10. The method of claim 8, wherein the audio signal includes two or more audio channels and the sound data compression and decompression algorithm includes at least two compression modes, a first mode wherein data of each of the two or more channels of the audio signal are compressed separately and a second mode wherein data of the audio signal of the two or more channels are combined together prior to
15 compression.

 11. The method of claim 2, wherein modifying the audio signal includes non-continuously removing at least one component from the audio signal.

 12. The method of claim 2, additionally comprising initially decompressing the audio signal from a compressed version thereof received over a
20 communications network, the initial decompression and the modification of the decompressed audio signal being carried out in a processor unit that isolates the decompressed audio signal from a user prior to its modification.

 13. The method of any one of claims 1-12, additionally comprising recording the modified signal in a physical storage medium.

25 14. The method according to claim 1, wherein modifying the signal additionally includes doing so in a manner that also minimizes the perceptibility of the modification when the signal is compressed and decompressed a first time but wherein said reduced quality is perceptible in the signal when reproduced from a decompression of the second compression of the signal.

15. The method of claim 14, wherein the interface signal is a audio signal and the reproduced signal is a sound signal.

16. The method of claim 15, wherein modifying the audio signal includes adding noise or audio data thereto.

5 17. The method of claim 16, wherein the noise or audio data is added to the audio signal in recurring bursts.

18. The method according to any one of claims 14 - 17, additionally comprising recording the signal in a first compressed version thereon in a physical storage medium.

10 19. A method of compressing a human interface signal, comprising modifying a process of its compression in a manner that minimizes the perceptibility of a resulting change to the signal when decompressed from said compression but which results in a second signal having a reduced quality when reproduced from a second compression and decompression of the decompressed audio signal.

15 20. The method of claim 19, wherein the interface signal is a audio signal and the second signal is a sound signal.

21. The method of claim 20, wherein modifying the compression process includes altering timing of processing of defined time sequential blocks of data of the audio signal.

20 22. The method of claim 20, wherein modifying the compression process includes doing so as a function of at least one characteristic of the audio signal.

23. The method of claim 20, wherein modifying the compression process includes using a quantizer adjusted to quantize individual frequency components of the audio signal in a manner that avoids the perceptibility of quantizing errors in the
25 audio signal when decompressed from said compression but which renders quantizing errors perceptible in a sound signal reproduced from the second compression and decompression of the decompressed audio signal.

24. The method of claim 20, wherein modifying the compression process includes adding encoded discontinuities to data resulting from compression of the audio signal.

25. The method of claim 24, wherein the encoded discontinuities are
5 characterized by invoking at least part of the time in a second compression at least one compression mode that is different from that which is invoked without the discontinuities.

26. The method of claim 25, wherein the encoded discontinuities are further characterized by intermittently invoking said at least one compression mode.

27. The method of any one of claims 19-26, additionally comprising
10 recording the compressed signal in a physical storage medium.

28. An audio signal in a form allowing reproduction thereof, comprising audio content that has been modified in a manner minimizing the perceptibility of the modification when the audio signal is reproduced but which causes the audio content to have a reduced quality when the audio signal is compressed and
15 decompressed.

29. The audio signal according to claim 28, wherein the modifications of the audio content include increased levels of certain frequency components of the audio content below making levels.

30. The audio signal according to claim 28, wherein the modifications
20 of the audio content are characterized by causing a sound compression and decompression algorithm to compress the audio signal at least part of the time by invoking at least one compression mode that is different than that which would be invoked by the audio content alone.

31. The audio signal according to claim 30, wherein the modifications
25 of the audio content are further characterized by causing the compression and decompression algorithm to intermittently invoke said at least one different compression mode.

32. The audio signal according to claim 28, wherein the audio signal includes a single audio selection, title, song or portion thereof.

33. The audio signal of any one of claims 28 - 32 stored on a physical storage medium.

5 34. The audio signal of claim 33, wherein the physical storage medium is selected from a group consisting of a magnetic storage device including a computer disk or an audio tape cassette, an optical storage device including a Compact Disc or a Digital Video Disc, motion picture film and a non-volatile semiconductor memory card.

10 35. A compressed version of an audio signal in a form allowing decompression and reproduction thereof, comprising a compressed version of audio content that has been modified in a manner minimizing the perceptibility of the modification when the audio signal is decompressed but which causes the audio content to have a reduced quality when the decompressed audio signal is compressed and decompressed for a second time.

15 36. The compressed audio signal according to claim 35, wherein the compressed audio signal is characterized by invoking at least part of the time in a second compression of the decompressed audio signal at least one compression mode that is different from that which is invoked without the modification to the audio content.

20 37. The compressed audio signal according to claim 36, wherein the compressed audio signal is further characterized by intermittently invoking the different compression mode in a second compression.

38. The audio signal according to claim 35, wherein the audio signal includes a single audio selection, title, song or part thereof.

25 39. The audio signal of any one of claims 35 - 38 stored on a physical storage medium.

40. The audio signal of claim 39, wherein the physical storage medium is selected from a group consisting of a magnetic storage device including a computer

disk or an audio tape cassette, an optical storage device including a Compact Disc or a Digital Video Disc, motion picture film and a non-volatile semiconductor memory card.

41. A signal processing device, comprising a memory and a processor controlled to modify an encrypted compressed input audio content signal to produce an unencrypted decompressed output signal with modifications selected to not be perceived but which, if the output signal were to be compressed and then decompressed a second time, would generate a second decompressed signal of poor quality, the processor and memory being protected to prevent a user from having ready access to an unencrypted version of said signal without said modifications.

42. A signal processing device, comprising a memory and a processor controlled to unencrypt and decompress an encrypted compressed input audio signal that has been processed so that an unencrypted decompressed output signal therefrom carries modifications selected to not be perceived but which, if the output signal were to be compressed and then decompressed a second time, would generate a second decompressed signal of poor quality, the processor and memory being protected to prevent a user from having ready access to an unencrypted version of said signal without said modifications.

43. The signal processing device of either one of claims 41 or 42, wherein the module is in the form of a card that is removably insertable into a sound reproducing device.

44. A system for processing an input audio signal to generate a modified version thereof as an output audio signal, comprising:

an analyzer receiving the input signal that determines acoustic elements of the input signal,

a function generator that receives the input signal acoustic elements and generates a function in response thereto that, when combined with the input signal, generates the output signal that is perceptively substantially the same as the input signal but which, when compressed and decompressed, would produce a sound signal that is perceptively significantly inferior to the input signal, and

a combiner of the input signal and the function that provides the output audio signal.

45. The system of claim 44, wherein the function generator includes a degradation function generator that modifies the input signal in a manner that the degradation would be perceptible in said sound signal.

46. The system of claim 44, wherein the function generator includes a forcing function generator that would cause an algorithm compressing the output signal to operate in an incorrect mode at least part of the time.

47. The system of any one of claims 45 or 46, wherein the function generator includes a masking function generator that operates in response to the acoustic elements of the input signal to reduce the perceptibility of the generated function in the output signal prior to any compression thereof.

48. An audio signal processing system, comprising:

an audio data compressor that receives an input audio signal and generates a compressed version thereof as an output audio signal,

an analyzer receiving the input signal that determines acoustic elements of the input signal,

a function generator that receives the input signal acoustic elements and generates a function in response thereto that, when inserted into the data compressor, causes the output signal from the data compressor to allow a sound signal to be decompressed therefrom that is perceptively substantially the same as the input signal but which, when compressed and decompressed a second time, would produce a second sound signal that is perceptively significantly inferior to the input signal, and

an inserter of the function into the data compressor.

49. The system of claim 48, wherein the function generator includes a degradation function generator that modifies the input signal in a manner that the degradation would be perceptible in said second sound signal.

50. The system of claim 48, wherein the function generator includes a forcing function generator that would cause an algorithm compressing the output signal a second time to operate in an incorrect mode at least part of the time.

5 51. The system of any one of claims 49 or 50, wherein the function generator includes a masking function generator that operates in response to the acoustic elements of the input signal to reduce the perceptibility of the generated function in the sound signal.